

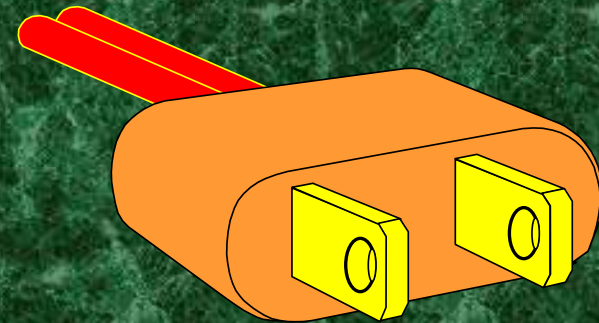
Electrical

Safety

Basic Electrical Safety

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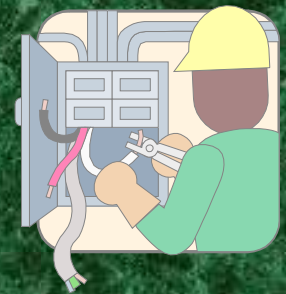
MASC Safety Office



Basic Electrical Safety

Basic Electrical Safety

- ✓ Course not designed to teach you to work on electrical equipment.
- ✓ You will not be qualified to work on electrical equipment.
- ✓ If you spot problems with electrical equipment you should report it to your supervisor.



Objectives

- Be familiar with the fundamental concepts of electricity.
- Be familiar with the effects of electricity on the human body.
- Be able to recognize common electrical hazards.



Objectives

- Be familiar with electrical protective devices.

Definitions

- Energized. Connected to an energy source or containing residual or stored energy.
- Exposed. Energized part that is capable of being touched or approached nearer than a safe distance.
- Ground-Fault Circuit-Interrupters (GFCI). Electrical receptacles designed to open the active (live) circuit when ground current exceeds a pre-established level, usually 5 milliamps.

Definitions

- Ground-Fault Interrupter (GFI). A GFI is an equipment protector, unlike the GFCI which is a personnel protector. It is intended to protect the equipment from damaging line-to-ground fault currents by opening all ungrounded conductors of the faulted circuit.
- Ground. An electrically conducting connection between equipment or an electric circuit and the earth or to some other conducting body.

Fundamentals of Electrical Hazards

- To flow electricity must have a complete path.
- Electricity flows through **conductors**
 - water, metal, the human body
- Insulators are non-conductors.
- The human body is a conductor.

Electrical

Safety

Fundamentals of Electrical Hazards

Have You Ever Been Shocked?

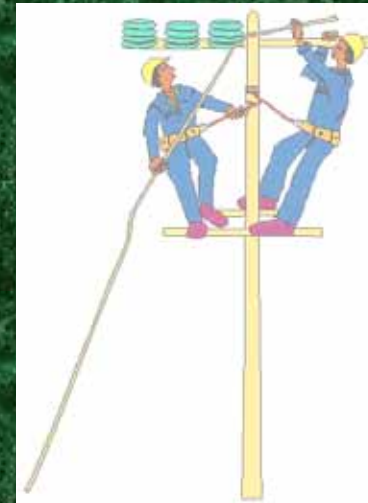
THE BASICS



Basic Electrical Safety

Fundamentals of Electrical Hazards

- ✓ **More than 3 ma**
painful shock
- ✓ **More than 10 ma**
muscle contraction “no-let-go” danger
- ✓ **More than 30 ma**
lung paralysis- usually temporary
- ✓ **More than 50 ma**
possible ventricular fib. (heart dysfunction, usually fatal)
- ✓ **100 ma to 4 amps**
certain ventricular fibrillation, fatal
- ✓ **Over 4 amps**
heart paralysis; severe burns. Usually caused by >600 volts



Fundamentals of Electrical Hazards

- Hazards of Electricity
 - Electrocution/Shock/Burns/Death
- Minimum distance from overhead lines 10 ft.
- Inspect all electrical tools and equipment

Frayed, cut, broken wires
grounding prong missing
Improper use of cube taps
improperly applied or missing strain relief



Electrical Protection

- **Circuit Breakers**
 - Provided to protect EQUIPMENT not people
 - Do not reset breakers with a line voltage higher than 120V and only reset if you know why it tripped
- **GFCI's**
 - Provided to protect people
 - Trip range 4-6ma
 - Monthly test

Electrical Protection

- **Distance**
 - If you sense the presence of an electrical hazard or exposed conductors that may be energized, keep your distance and STAY AWAY

Energized Equipment

If live parts operate at more than 50 volts to ground, they need to be de-energized. If the risk of exposure to electrical burns, explosions due to electric arcs, or risk of equipment damage exists the equipment should be de-energized before maintenance is performed by a qualified individual.

Lock Out Tag Out

If a qualified person determines that the equipment should be de-energized then the circuits energizing the parts to worked on shall be locked or tagged, following procedures for Control of Hazardous Energy Sources.

Stored Electrical Energy

- Stored electrical energy, such as capacitors also poses a risk to personnel if released.

Fundamentals of Electrical Hazards

- Voltage
 - electrical pressure (water pressure)
- Amperage
 - electrical flow rate (gallons/min)
- Impedance
 - restriction to electrical flow (pipe friction)

Fundamentals of Electrical Hazards

- **Circuit**
 - path of flow of electricity
- **Circuit Element**
 - objects which are part of a circuit and through which current flows.
- **Fault**
 - current flow through an unintended path.

Fundamentals of Electrical Hazards

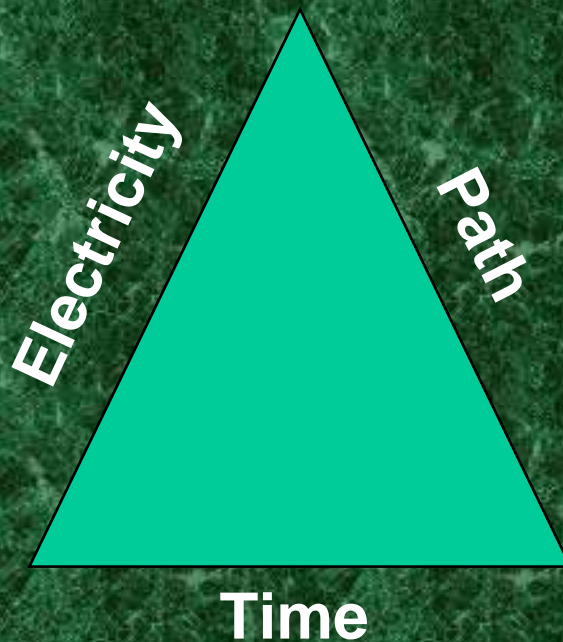
- What is Grounding?
 - Protection from electric shock
 - normally a secondary protection measure
- A ground is a conductive connection
 - between electrical circuit or equipment and earth or ground plane
 - creates a low resistance to the earth.

Basic Rules of Electrical Action

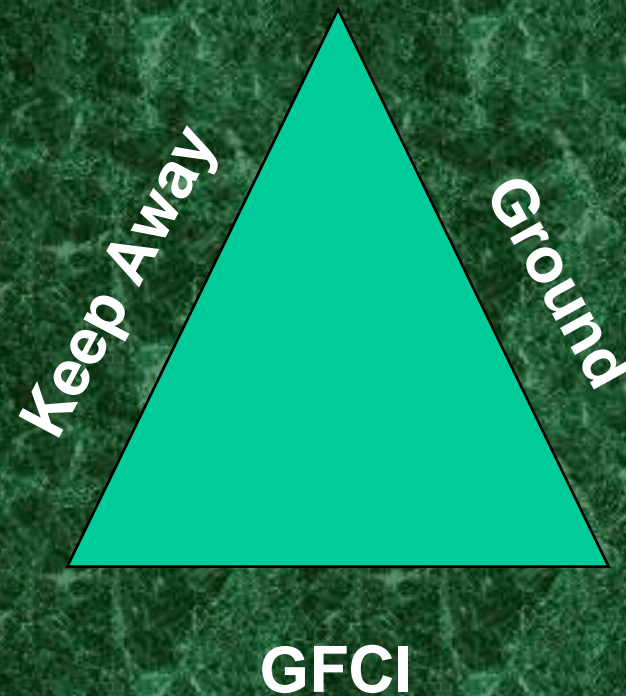
- Electricity isn't live until current flows
- Electrical current won't flow until there is a complete loop, out from and back to the power source.

Preventing Accidental Electrical Contact

Electrocution



Prevention



Do's and Don'ts

- **Do** plug power equipment into wall receptacles with power switches in the Off position.
- **Do** unplug electrical equipment by grasping the plug and pulling. Do not pull or jerk the cord to unplug the equipment.
- **Do not** drape power cords over hot pipes, radiators or sharp objects.

Do's and Don'ts

- **Do** check the receptacle for missing or damaged parts.
- **Do not** plug equipment into defective receptacles.
- **Do** check for frayed, cracked, or exposed wiring on equipment cords.

Do's and Don'ts

- **Do** check for defective cords clamps at locations where the power cord enters the equipment or the attachment plug.
- Extension cords should not be used in office areas. Generally, extension cords should be limited to use by maintenance personnel

Do's and Don'ts

- “Cheater plugs”, extension cords with junction box receptacle ends or other jury-rigged equipment **should not** be used.

Do's and Don'ts

- Consumer electrical equipment or appliances **should not** be used if not properly grounded. (Look for the UL Label)

Do's and Don'ts

- Employees **should know** the location of electrical circuit breaker panels that control equipment and lighting in their respective areas. Circuits and equipment disconnects must be identified

Do's and Don'ts

- Temporary or permanent storage of any materials **must not** be allowed within 3 feet of any electrical panel or electrical equipment.
- Any electrical equipment causing shocks or with high leakage potential must be tagged with a Danger tag or equivalent.

Myths and Misconceptions

- Electricity takes the path of least resistance.
- Electricity wants to go to ground.
- If an electric tools falls into a sink or tub of water, the item will short out.

Myths and Misconceptions

- AC reverse polarity is not hazardous.
- It takes high voltage to kill; 120 volts is not dangerous.
- Double insulated power tools are doubly safe and can be used in wet and damp locations.

**SAFETY
FIRST**

**THE SAFE WAY IS
THE BEST WAY**



Questions?

- Please contact the MASC Regional Safety Manager at (303) 497-3912 or Rhonda.S.Carpenter@noaa.gov